The Enhancing Effects of Anxiety on Arousal in Sexually Dysfunctional and Functional Women

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Effects of anxiety on sexual arousal were examined to determine if sexually dysfunctional and functional women exhibit different patterns of physiological and subjective response. Subjects viewed 2 videotape conditions: an anxiety-evoking and neutral–control preexposure stimulus, each paired with a sexual arousal-evoking stimulus. Anxiety preexposure enhanced the rate and magnitude of genital arousal for both dysfunctional and functional subjects in relation to the neutral condition. Despite increased genital responses, both groups reported less subjective sexual arousal after anxiety preexposure. Functional subjects exhibited greater physiological but not subjective arousal than dysfunctional subjects in both conditions. Results are discussed in terms of desynchronous patterns of sexual response, mechanisms by which sympathetic activation enhances sexual arousal, and implications for treatment of sexual dysfunction in women.

Anxiety continues to be viewed as a major determinant of low sexual arousal and a leading cause of sexual dysfunction for both men and women. Wolpe (1958, 1982) has claimed that anxiety reciprocally inhibits the parasympathetic response components that elicit sexual arousal. Masters and Johnson (1970) described anxiety as the greatest known deterrent to sexual arousal due to its effect of inhibiting physiological response by interfering with the reception of sexual stimuli. Similarly, Kaplan (1974, 1988) has identified anxiety as the critical mechanism that prevents physiological sexual arousal through the disruption of autonomic nervous system functioning. On the basis of these assumptions, anxiety-reduction techniques, presumed to enhance sexual arousal by increasing parasympathetic response or by decreasing sympathetic response, are widely adopted in the treatment of sexually dysfunctional men and women. However, the autonomic pathways and processes whereby sexual excitation is initiated and heightened remain a matter of conjecture (Schnieden & Rees, 1985). Techniques

such as sensate focus therefore enjoy widespread clinical popularity despite their lack of a theoretical rationale supported by empirical knowledge of the initiating stimuli and autonomic processes that control female sexual arousal. Contrary to the etiological assumptions of more than 30 years, a growing research literature indicates that heightened anxiety, characterized by sympathetic activation, may enhance rather than inhibit sexual arousal.

Hoon, Wincze, and Hoon (1977) demonstrated that sexual arousal is enhanced in sexually functional women when they are exposed to an anxiety-evoking rather than relaxation-inducing film stimulus before exposure to sexual stimuli. Investigations with sexually functional men have also demonstrated a facilitatory effect of anxiety on sexual arousal, in which anxiety has been operationally defined as crossing a fear-arousing suspension bridge (Dutton & Aron, 1974), viewing an anxiety-evoking film segment (Wolchik et al., 1980), receiving the threat of a shock contingent on the size of erection (Barlow, Sakheim, & Beck, 1983), and receiving performance demand instructions to self-monitor and maintain an erection (Heiman & Rowland, 1983). These studies provide evidence against the role of anxiety as an inhibitory mechanism and demonstrate that in certain conditions anxiety enhances sexual arousal in functional men and women.

One explanation for the facilitatory effects of anxiety on sexual arousal involves cognitive mislabeling or misattributing generalized physiological arousal as sexual arousal (Beggs, Calhoun, & Wolchik, 1987; Dutton & Aron, 1974). Similarly, excitation transfer theory (Zillmann, 1983) suggests that the misattribution of residual excitation from an excitatory physiological response will enhance emotional responses to novel stimuli. If functional persons mislabel generalized anxiety as sexual arousal, it is possible that dysfunctional persons may make different cognitive interpretations (Norton & Jehu, 1984). Investigations to compare patterns of sexual arousal in functional and dysfunctional men have revealed that these groups respond differently to pairings of anxiety-evoking and erotic cues: Anxiety, defined as performance demands to maintain an

erection either by verbal instruction (Heiman & Rowland, 1983) or contingent on shock (Barlow, 1986), increased physiological sexual arousal in functional men and decreased physiological sexual arousal in dysfunctional men. On the basis of these and a related series of studies, Barlow (1986, 1988) has concluded that for dysfunctional men and women, anxiety inhibits sexual arousal by facilitating the efficiency with which their cognitive focus is diverted from erotic cues. To date, the effects of anxiety on sexual responding in dysfunctional subjects have been tested exclusively with men.

Contradictory findings exist in the literature on the relationship between cognitive and physiological patterns of sexual arousal in women. Wincze, Hoon, and Hoon (1976) found that sexually functional and dysfunctional women experience different physiological but report similar subjective responses to erotic stimuli. They provided a behavioral–physiological interpretation of these findings, suggesting that dysfunctional women possess a constrained or narrowed repertoire of sexual behavior that may be gradually increased in variety and frequency in order to enhance physiological response. Conversely, Morokoff and Heiman (1980) found that these groups experience similar physiological but report different subjective responses to erotic stimuli. They provided a cognitive–affective interpretation of their findings, suggesting that women with low arousal do not attend to genital cues and that cognitive techniques that focus on the experience of arousal may enhance subjective perceptions. The apparent discrepancy in regard to the patterns of sexual response between functional and dysfunctional women remains unresolved.

The first objective of our study was to examine the effects of anxiety on sexual arousal to determine if sexually dysfunctional and functional women respond differentially to pairings of anxiety-evoking and erotic cues. The second objective was to clarify the contradictory findings about subjective and physiological patterns of sexual response between dysfunctional and functional women exposed to erotic stimuli. Using the combined methodological procedures of Hoon et al. (1977), Wincze et al. (1976), and Morokoff and Heiman (1980), we assessed subjective and physiological arousal in response to the presentation of an anxiety-evoking (threatened amputation videotape) and neutral–control (travelogue videotape) stimulus, each paired with a sexual arousal-evoking (erotic videotape) stimulus.

This study extends previous research in several respects. It provides the first exploration of the effects of anxiety on arousal in sexually dysfunctional women and the first comparison of functional and dysfunctional women's physiological and subjective patterns of arousal to anxiety-eliciting stimuli. The system of data collection and reduction designed for the study also provides the first continuous digital measurement, compilation, and graphic representation of vaginal blood volume (VBV) in women. This method may provide more valid and reliable data because hand-calculated deviations from baseline polygraph recordings sampled at 1- to 10-s intervals are replaced by direct analog–digital transfer of 0.0001 mV changes in VBV at 0.20-s intervals.

Method

Subjects

Thirty-two women participated in the investigation. The sexually dysfunctional group comprised 16 women contacted through the sex-

ual medicine unit at a local hospital and through five private therapists who specialize in the treatment of sexual difficulties. Subjects had undergone initial assessment by their referring physicians and were diagnosed as experiencing psychogenic sexual dysfunction. Participation in the study was voluntary, occurred before treatment, and did not affect the course of further treatment or medical care. Subjects in the dysfunctional group (mean age = 30 years, range, 22–39) reported dissatisfaction with their current sexual functioning and had requested treatment for one or more sexual dysfunctions: Three reported primary difficulties with low sexual desire, six with primary inorgasmia, two with secondary inorgasmia, two with coital inorgasmia, and three with dyspareunia. Ten of these subjects had secondary complaints of low sexual desire and 4 of low sexual arousal. Two subjects also reported a history of sexual abuse. The sexually functional group comprised 16 women recruited through university newspaper advertisements. Subjects in the functional group (mean age = 28 years, range, 22–50) reported satisfaction with their current sexual functioning and had no history of treatment for sexual dysfunctions. All subjects reported that they were not taking medications of any kind, had an exclusively heterosexual orientation, and were currently involved in a sexual relationship.

Profile descriptions of each group were provided by the Derogatis Sexual Functioning Inventory (DSFI; Derogatis, 1978). The Sexual Functioning Index (SFI) and Global Sexual Satisfaction Index (GSSI) of the DSFI were used to validate differences between groups. Subjects in the dysfunctional group scored below the 50th percentile on both the SFI (i.e., the global level of sexual functioning was less than the mean for the normative sample) and GSSI (i.e., their present sexual relationship rated *adequate* to *could not be worse*). Subjects in the functional group scored greater than or equal to the 50th percentile on both the SFI and GSSI (i.e., their present sexual relationship rated *above average* to *could not be better*). Data from the Experience subtest of the DSFI was used to verify that dysfunctional and functional women had experienced a similar duration and repertoire of sexual behaviors. All subjects were within the normative range of experience scores for nonpatient samples and reported a similar duration of sexual experience calculated as the difference between age at first intercourse and current age (for the dysfunctional group, $M = 12.94$ years, range, 4–22; for the functional group, $M = 10.75$ years, range, 2–31). The Brief Symptom Inventory (BSI; Derogatis, 1975) subtest of the DSFI was used to screen all subjects for absence of general psychopathology by using the 30th percentile as the cutoff criterion (i.e., within two standard deviations of the mean for the normative sample). All subjects were paid $20 for their participation.

Apparatus and Materials

Stimuli. Preexposure stimuli consisted of two 3-min videotapes, a neutral travelogue sequence and an anxiety sequence depicting threatened amputation. The experimental stimuli, or erotic sequences, consisted of two 3-min videotapes of a nude heterosexual couple engaging in foreplay and intercourse. The content of the erotic scenes were matched on the number, order, type, and duration of sexual activities and contained the same actors and setting. The erotic segments were edited from a videotape provided by John P. Wincze and were found to reliably elicit sexual arousal in functional women (personal communication, May 27, 1987). The neutral–control segment was adapted from a film also provided by Wincze.[1]

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[1] In order to assess the validity of the stimuli manipulations, a separate pilot study was conducted with five potentially anxiety-eliciting and five potentially arousal-eliciting film segments. Twelve sexually functional women viewed either the randomly assigned anxiety or erotic films. The most anxiety-evoking segment was chosen on the basis of physiological measures of heart rate and subjective ratings of

Physiological measurement. A vaginal photoplethysmograph (Sintchak & Geer, 1975) was used to measure physiological sexual arousal by changes in $VBV.^2$ In order to minimize potential light history and temperature sensitivity effects and to assess baseline stability, the photoplethysmograph was allowed a 45-min warm-up period before insertion, followed by a 10-min recorded adaptation period before the onset of experimental stimuli. The signal from the Geer gauge and module (Farrall Instruments, Grand Island, NE) were channeled through an optical isolator–power supply and monitored on a Beckman Instruments (Schiller Park, IL) Type R 611 dynagraph. The VBV signal for each subject was recorded at a sampling rate of 5 times/s with the Data Translation (Marlborough, MA) analog–digital converter and Labtech Notebook software (Laboratory Technologies Corporation, 1986) installed on a Compaq 386 microcomputer. The software program timed the administration of the stimuli and used a trigger signal to initiate recording and mark stimulus changeover.

Subjective measurement. A self-report rating scale of 33 items was used to assess: sexual arousal (1 item) and perceptions of physical sexual change (4 items); autonomic arousal (5 items) and anxiety (1 item); and positive affects (11 items) and negative affects (11 items). Subjects rated the degree to which they experienced these items on 7-point Likert scales from *not at all* (1) to *intensely* (7). Subjective sexual arousal was defined by 5 items on this scale: Sexually aroused, warmth in genitals, genital wetness or lubrication, genital pulsing or throbbing, and any genital feelings. The subjective reaction scale was adapted from Heiman and Rowland (1983) and has been determined to be a sensitive indicator of emotional reactions to erotic stimuli (Heiman, 1980; Heiman & Rowland, 1983; Morokoff & Heiman, 1980). No significant differences have been found in results obtained by methods of discrete versus continuous subjective measurement (Steinman, Wincze, Sakheim, Barlow, & Mavissakalian, 1981).

Derogatis Sexual Functioning Inventory. The DSFI is a standardized self-report multidimensional inventory composed of eight distinct subtests designed to measure the current level of sexual functioning. The Experience subtest assesses the range of hierarchically scaled sexual behaviors experienced by the person. The subtest that measures psychological symptomology is a distinct psychometric diagnostic instrument, the BSI, empirically validated before the development of the DSFI as an independent measure of psychopathology. The DSFI provides a profile score derived from a summation of the subtest scores, the SFI, which reflects the overall quality of current sexual functioning, and a single item score, the GSSI, which reflects the respondent's self-perception of the quality of sexual functioning. The DSFI has been determined to be a valid and reliable measure for differentiating sexually functional and dysfunctional women (Derogatis & Melisaratos, 1979; Derogatis & Meyer, 1979).

Design and Procedure

The experimental design and procedure were similar to that used by Hoon et al. (1977) with sexually functional women and Wolchik et al. (1980) with functional men. A repeated measures design was used in which each subject was presented two videotape stimulus sequences. The order of the videotapes was counterbalanced across subjects. Each sequence pair began with a 1-min display of the word *relax,* followed by a 1-min neutral orientation stimulus, the 3-min neutral or anxiety preexposure stimulus, and finally the 3-min erotic experimental stimulus. Changeover from preexposure to experimental stimuli was immediate.

anxiety and autonomic arousal; the most sexually arousing pair of segments were chosen on the basis of vaginal blood volume and subjective ratings of sexual arousal and physical sexual change. The selected sexually arousing segments evoked equivalent levels of genital and subjective sexual arousal.

The procedure consisted of two 1-hr sessions and was identical for all subjects. After an initial telephone interview, the subjects were scheduled for a first session with one of two female experimenters. During this session the subjects viewed the laboratory facilities and equipment, received verbal instructions on the use of the photoplethysmograph, discussed issues related to the experiment, and signed the standard consent form. The DSFI was then completed privately in a separate subject room. The subjects were told the purpose of the investigation was to learn about emotional and physiological reactions to brief visual stimuli, some of which may include erotic content. Subjects who fulfilled the criteria were contacted by telephone to schedule a second session for the experimental procedure. All subjects were requested to abstain from psychoactive drugs (including caffeine and alcohol) for 24 hr before the second session.

During the second session the subjects inserted the photoplethysmograph with the aid of diagrammed instructions in a private, internally locked room maintained at a constant 21.7 °C. The instrument was sterilized in Cidex (long-life activated dialdehyde solution; Surgikos Canada, Peterborough, Ontario) between uses. A color television monitor was positioned where subjects could sit comfortably in a recliner with full view of the screen. Subjects remained fully clothed and were covered with a light blanket. They were instructed to sit quietly for at least 10 min before the onset of the experiment for purposes of adaptation and to remain as still as possible throughout the session. Immediately after the conclusion of the erotic stimuli, the subjects completed the subjective rating scale for the preceding sequence. Ten min after the erotic film, and 5 min after completion of the form, if VBV readings had not returned to baseline level, the subjects were asked to count aloud backwards by 3s from 100 to facilitate decreased arousal. When VBV readings returned to baseline level, the second stimulus sequence was presented. At the conclusion of the experimental session, each subject was debriefed in order to assure their comfort with the procedure, assess their understanding of the instructions and equipment, and acquire further information with regard to their reactions to the stimuli.

Data Reduction

The level of sexual arousal for each subject was measured as 0.0001 mV of VBV deviation from a baseline reference level recorded at the point of changeover from the preexposure to experimental stimulus. VBV data were collected 5 times/s during the last 80 s of preexposure and the entire 180 s of experimental stimuli (1,300 data points/subject/condition). For graphic representation of continuous VBV across subjects, each time sample was averaged across all subjects in each group and stimulus condition (i.e., 2 groups × 2 conditions × 1,300 0.20-s means). For the statistical analyses, time samples for each subject and condition were averaged across twenty-six 10-s time blocks. The point of greatest physiological sexual arousal for the correlational analyses was defined for each subject as the 10-s time block with the greatest VBV deviation from baseline (i.e., 50 time samples/subject).[3]

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[2] Although there are relative merits to the two measures that can be obtained from the photoplethysmograph, vaginal pulse amplitude (alternating current) and vaginal blood volume (direct current), vaginal blood volume was selected in accordance with suggestions in the literature that it may be the maximally sensitive measure of genital vasocongestion and reflects location specific changes in the direction, rate, and magnitude of vaginal blood flow during engorgement (Beck, Sakheim, & Barlow, 1983; Rosen & Beck, 1988).

[3] This data reduction method was adapted from Morokoff and Heiman (1980) with women and Heiman and Rowland (1983) with men to determine maximum genital response for correlational analyses with subjective measures. It is used here for the purpose of comparison with previous findings.

Table 1
Group Differences on Profile Scores From the Derogatis Sexual Functioning Inventory (DSFI)

DSFI	Dysfunctional group mean	Functional group mean	$F(1, 30)$	p
Subtest				
Information	51.06	56.44	2.67	.109
Experience	50.12	56.31	4.94	.032
Drive	49.44	58.37	10.53	.003
Attitude	51.12	53.94	1.57	.218
Symptoms (BSI)	39.00	49.31	24.05	.001
Affects	38.78	56.25	50.20	.00001
Gender Role Definition	49.37	51.87	0.34	.567
Fantasy	52.25	60.50	4.72	.036
Body Image	46.12	50.06	1.37	.250
Satisfaction	33.31	57.12	74.56	.00001
Global score				
Sexual Functioning Index	40.00	64.28	87.86	.00001
Global Sexual Satisfaction Index	37.87	61.00	139.85	.00001

Note. Means are based on raw scores that were converted to established percentile rankings (*T* scores).
BSI = Brief Symptom Inventory.

Results

Group Differences in Sexual Functioning

Profile scores from the DSFI were analyzed by a 2 × 12 (Group × Profile Score) multivariate analysis of variance (MANOVA) in order to validate differences between dysfunctional and functional groups on measures of current sexual functioning. Because multiple repeated measurements are likely to violate the traditional analysis of variance (ANOVA) assumptions of independence and sphericity, multivariate tests based on the Pillai-Bartlett trace statistic were used for all analyses that involved more than two repeated measurements (O'Brien & Kaiser, 1985; Olson, 1976). Table 1 shows that dysfunctional subjects attained significantly lower SFI and GSSI scores than functional subjects. Specifically, dysfunctional subjects were significantly less satisfied with their sexual behavior than functional subjects in terms of the frequency and degree of variation in sexual activities, communication between sexual partners, arousal during foreplay, length of intercourse, ability to achieve orgasm, and feeling fulfilled after sexual activity. Individual items on the Satisfaction subtest revealed that dysfunctional women were significantly less orgasmic, $t(30) = 10.25$, $p < .001$, and less interested in sexual activity, $t(30) = 6.71$, $p < .001$. Specifically, 87.5% reported infrequent orgasm during sexual activity, and 75% reported low sexual desire. The dysfunctional group also reported significantly lower levels of sexual drive, a lesser frequency and variety of sexual fantasies, and greater psychological symptoms of distress and negative affect. These differences validate the designation of the women referred from the sexual medicine clinic and private therapists as sexually dysfunctional and of the nonclinical comparison group as sexually functional.

Internal Validity of Physiological Measures

Changeover. In order to verify that no differences in VBV occurred between groups or stimulus conditions at changeover from preexposure to experimental stimuli, VBV baseline levels across the last 10 s of preexposure stimuli were averaged and

compared prior to reference level adjustment. A 2 × 2 (Group × Stimulus) ANOVA with repeated measures on the second factor, revealed no significant group, stimulus, or interaction effects. These mean VBV levels at changeover were −0.02 mV in the neutral–erotic and −0.06 mV in the anxiety–erotic conditions for dysfunctional subjects and −0.09 mV in the neutral–erotic and −0.23 mV in the anxiety–erotic conditions for functional subjects.

Preexposure stimuli. The mean VBV (millivolts deviation from baseline) for dysfunctional and functional women during preexposure conditions are presented in Figure 1. A 2 × 2 × 8 (Group × Stimulus × 10-s Time Block Mean) MANOVA was computed to investigate the assumption that no significant differences in VBV occurred across the last 80 s of neutral or anxiety stimulus preexposure in relation to baseline levels at changeover. The results revealed no significant main or interaction effects of group or stimulus and no three-way interaction. A significant Group × Time interaction was found, $F(7, 24) = 3.11$, $p = .02$, although simple effects analyses revealed no significant differences between dysfunctional and functional groups at any time period across the last 80 s of preexposure. Interestingly, further analyses revealed that functional women demonstrated a significant decrease in VBV as a function of time during exposure to the anxiety-eliciting stimulus, $F(7, 24) = 7.50$, $p = .0002$, whereas dysfunctional women experienced no significant changes.

Given that no significant differences in VBV levels were found between groups or stimuli at changeover from preexposure to experimental stimuli prior to reference level adjustment, nor were differences found to occur between groups or stimuli at any specified time during the 80 s of preexposure, these findings are consistent with the assumption that subjects demonstrated similar levels of genital arousal before the onset of experimental stimuli.

Physiological Sexual Arousal

A 2 × 2 × 18 (Group × Stimulus × 10-s Time Block Mean) MANOVA was computed to investigate the effects of neutral
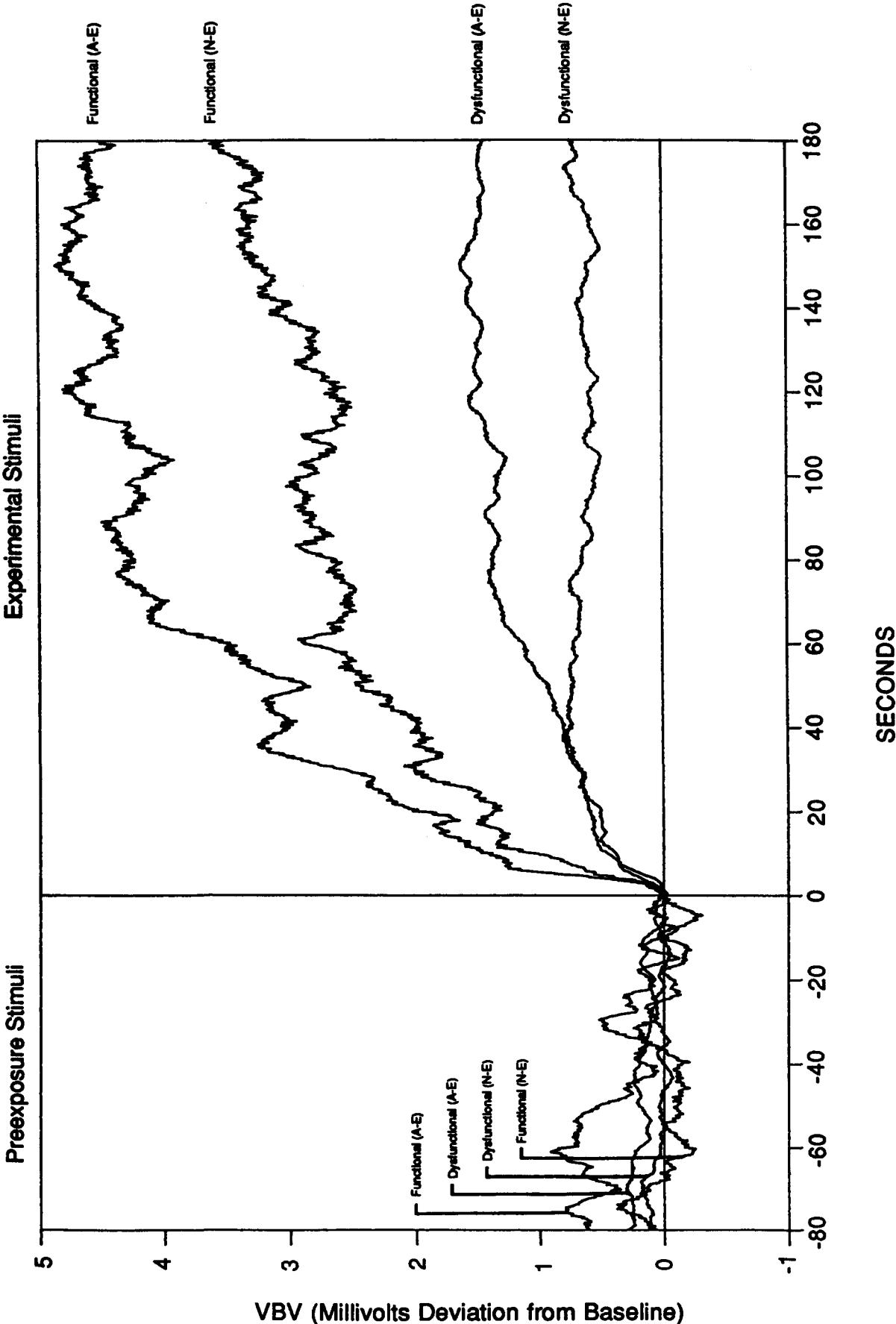
Figure 1. Mean vaginal blood volume (millivolts deviation from baseline) sampled 5 times/s for sexually dysfunctional and functional women during anxiety–erotic (A–E) and neutral–erotic (N–E) conditions.

and anxiety-eliciting stimuli on physiological measures of sexual arousal in dysfunctional and functional groups. Mean VBV data during experimental conditions are plotted in Figure 1. Effects for group, $F(1, 30) = 11.74$, $p = .002$, stimulus, $F(1, 30) = 15.05$, $p = .0008$, and time, $F(17, 14) = 14.32$, $p < .00001$, and the Group × Stimulus × Time interaction, $F(17, 14) = 4.55$, $p = .004$, were significant. The Group × Stimulus interaction was not significant. Analysis of stimulus effects as a function of time revealed that anxiety preexposure elicited significantly greater genital arousal than neutral preexposure, $F(17, 14) = 9.49$, $p = .0002$. Specifically, simple effects analyses between stimulus conditions for each group at each time block revealed that in the functional group, anxiety preexposure significantly increased sexual arousal relative to the neutral-control stimulus within 30 s of the onset of the erotic tapes, $F(1, 30) = 8.31$, $p = .007$. This effect remained statistically significant at each time block throughout the remainder of the erotic stimuli (p < .05). Moreover, in the dysfunctional group, anxiety preexposure also significantly increased sexual arousal within 120 s of the onset of the erotic stimuli, $F(1, 30) = 4.16$, $p = .05$. Again, the arousal-enhancing effect of the anxiety stimulus remained statistically significant throughout the remainder of the erotic films (p < .05). Simple effects analyses across time blocks for each group and stimulus condition further revealed that for dysfunctional subjects, significant increases in genital arousal were achieved only after anxiety preexposure, $F(17, 14) = 3.56$, $p = .01$, whereas functional subjects demonstrated significant increases after neutral, $F(17, 14) = 6.53$, $p = .0008$, and anxiety stimuli, $F(17, 14) = 18.26$, $p < .00001$.

It is interesting to note that 100% of the dysfunctional sample experienced enhanced genital arousal after exposure to the anxiety-eliciting stimulus. This effect was consistent across a heterogeneous population including women who were experiencing low desire, low arousal, primary and secondary inorgasmia, and dyspareunia, and two women with a history of sexual abuse.

Investigation of group effects as a function of time revealed that dysfunctional women experienced significantly less of an increase in VBV than functional women, $F(17, 14) = 4.21$, $p = .005$. Specifically, simple effects analyses revealed that the dysfunctional group was significantly less aroused than the functional group in both the neutral-erotic condition at 20 s, $F(1, 30) = 7.49$, $p = .01$, and the anxiety-erotic condition at 10 s, $F(1, 30) = 4.93$, $p = .03$, after the onset of the erotic stimuli. These differences between groups remained statistically significant for both conditions at each time block throughout the remainder of the erotic films (p < .05).

Subjective Sexual Arousal

A 2 × 2 × 5 (Group × Stimulus × Item) MANOVA was computed to investigate the effects of stimulus condition on subjective perceptions of sexual arousal. Mean subjective ratings of sexual arousal are presented in Figure 2. A significant stimulus effect, $F(1, 30) = 4.75$, $p = .03$, but no significant group effect or three-way interaction was found. Analysis of stimulus effects across items revealed that both dysfunctional and functional women rated the anxiety-erotic condition as significantly less sexually arousing than the neutral-erotic condition, $F(4, 27) = $
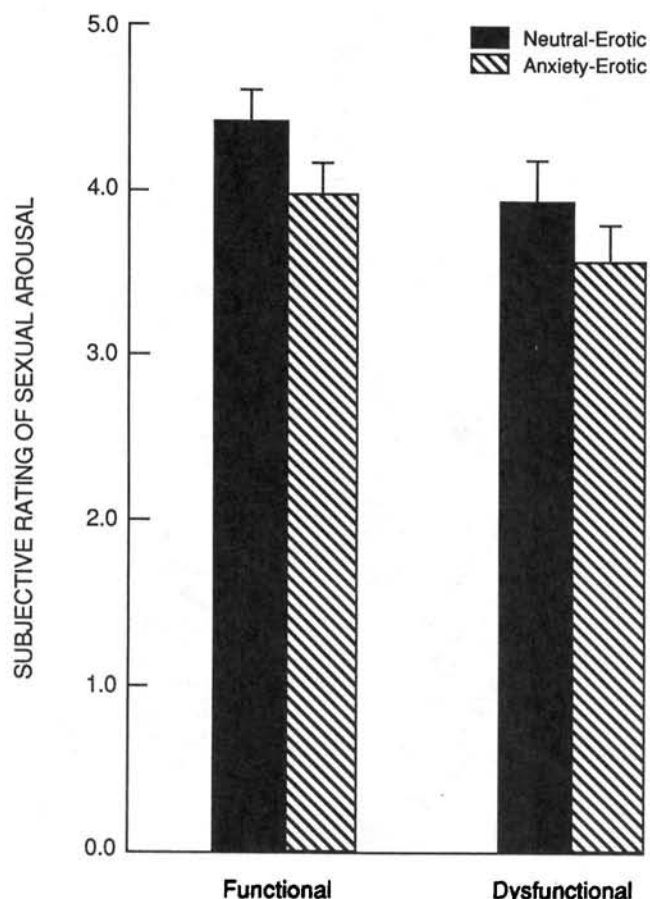

Figure 2. Mean subjective ratings of sexual arousal for sexually dysfunctional and functional women during anxiety-erotic and neutral-erotic conditions.

2.68, $p = .05$. Simple effects analyses between stimulus conditions for each of the five scale items revealed that they were differentially effective in detecting subjectively experienced sexual arousal to film stimuli. Specifically, for both groups "genital pulsing or throbbing" was the only item to reveal a significant difference, $F(1, 30) = 12.74$, $p = .001$.

Investigation of group effects across stimulus conditions and items revealed no significant differences in subjective ratings of arousal.

As can be seen in Figures 1 and 2, subjective ratings do not parallel physiological responses. The physiological data reveal that the anxiety-eliciting stimulus significantly enhanced genital arousal for both groups, with the dysfunctional group exhibiting less sexual arousal than the functional group in each condition. Conversely, the subjective data reveal that both groups rated the anxiety-erotic condition as significantly less sexually arousing, with no significant differences between groups for either condition.

Subjective Autonomic Arousal

A 2 × 2 × 6 (Group × Stimulus × Item) MANOVA was analyzed to evaluate the effects of stimulus condition on subjective

perceptions of autonomic arousal. A significant stimulus effect, $F(1, 30) = 6.14$, $p = .02$, revealed that both dysfunctional and functional women reported significantly greater perceptions of autonomic arousal during the erotic stimulus preceded by the anxiety-eliciting as compared with the neutral–control condition. These perceptions of enhanced sympathetic arousal included: "anxious," "faster breathing," "faster heart beat," "perspiration," "feelings of warmth," and "any physical reaction at all."

Affective Response

In order to evaluate the effects of stimulus condition on affective response, a $2 \times 2 \times 11$ (Group $\times$ Stimulus $\times$ Item) MANOVA was analyzed separately for positive and negative items. The positive affective items revealed no significant group, stimulus, or interaction effects. Similarly, the negative affective items revealed no significant group or stimulus effects; however, a Stimulus $\times$ Item interaction revealed that both groups reported feeling significantly more "worried" after anxiety, as compared with neutral preexposure, $F(1, 30) = 8.44$, $p = .007$.

Relationship Between Physiological and Subjective Responses

In order to investigate the degree of association between VBV and subjective ratings, Pearson product–moment correlation coefficients were calculated separately for each subject, stimulus condition, and item. No correlations were significant at $p < .01$, which suggests that for both dysfunctional and functional women, heightened genital arousal was not accompanied by the increased likelihood of acknowledging or reporting sexual feelings.

Discussion

The results of this study demonstrate that physiological sexual arousal in women may be enhanced by exposure to an anxiety-eliciting stimulus. These effects include a more rapid acquisition as well as a greater magnitude of genital arousal for both sexually dysfunctional and functional women. Contrary to their increased physiological responses, both groups rated the anxiety–erotic condition as significantly less sexually arousing. These findings reveal the potential for a desynchronous relationship between subjective and physiological sexual response in women.

The finding that anxiety preexposure elicits enhanced genital arousal in sexually functional women replicates the results of Hoon et al. (1977) and is consistent with the literature on sexually functional men (Barlow et al., 1983; Dutton & Aron, 1974; Heiman & Rowland, 1983; Wolchik et al., 1980). Evidence that dysfunctional women's genital arousal is facilitated by exposure to an anxiety-eliciting stimulus, however, is opposite to the pattern generally reported in men (e.g., Barlow, 1986, 1988; Heiman & Rowland, 1983). The finding that the components of female sexual response are not necessarily concordant is consistent with previous research (Morokoff & Heiman, 1980; Steinman et al., 1981; Wincze et al., 1976) and differs from the

synchrony generally reported in men (e.g., Heiman & Rowland, 1983; Rosen & Beck, 1988; Steinman et al., 1981).

Several factors may account for the discrepancy observed between subjective and physiological sexual arousal. First, social dictates and double standards of sexual etiquette may discourage women from attending to or verbally acknowledging genital cues. This interpretation is consistent with the finding that discordance for the functional women was as great as for the dysfunctional women and that no group differences were revealed in perceptions of physical sexual change, autonomic change, or affective response to erotic stimuli. In some instances this lack of attentional focus may become a conditioned response, attenuating or extinguishing the arousal response to sexual cues. Second, because women possess a less obvious physiological feedback system (e.g., vasocongestion versus erection), some women may experience more difficulty attending to bodily cues (Heiman, 1977), which may yield a lack of synchrony between physiological and subjectively experienced arousal. This is not to suggest that genital arousal is less intense in women than in men but rather that the lack of a physically observable reminder may facilitate social demands for women to ignore or habituate sexual arousal similar to the way men and women often disregard other internal cues such as hunger or fatigue.

Our findings challenge several explanations for the effects of anxiety. Wolpe (1978) suggested that paradigms for presenting anxiety and arousal stimuli sequentially may result in an anxiety-relief or negative reinforcement phenomenon. Although several investigations with functional men have presented anxiety and erotic stimuli simultaneously, simultaneous (e.g., Barlow et al., 1983) versus sequential (e.g., Wolchik et al., 1980) paradigms have not revealed different results. Replication of the present study in a simultaneous design with women or alternatively in a sequential design with dysfunctional men is necessary to evaluate the potential for differential effects. However, our finding that both dysfunctional and functional women reported a significantly greater level of autonomic arousal (anxious, worried, faster breathing, faster heart beat, perspiration, feelings of warmth, and physical reaction) during the erotic stimuli after anxiety as compared with neutral preexposure suggests that anxiety arousal carried over to the erotic condition (i.e., was experienced simultaneously). It is important to note that these cognitions did not inhibit physiological arousal but rather accompanied enhanced genital response. The cognitive side of emotional experience did not, therefore, immediately influence the physiological response or vice versa. This finding cannot be explained by anxiety relief given that anxiety was reported throughout the erotic exposure and there were no significant differences in VBV between stimulus conditions at changeover. It is also not explained by misattribution given that subjective and physiological reports were opposite and not reciprocally influenced. Neither did anxiety serve to diminish genital arousal by facilitating distraction from erotic cues, given that physiological arousal was significantly enhanced. Rather, these findings suggest an alternative explanation for the effects of anxiety on sexual arousal: Anxiety may enhance sexual arousal through the direct instigation and facilitation of sympathetic activation (i.e., increased blood pressure, heart rate, respiration, and muscle tension), which serves to prepare the person

for sexual arousal (vasocongestion). Cognitive expectancy may provide a secondary effect that further increases or decreases the physiological effect elicited by sympathetic nervous system activation.

The results of between-groups comparisons from our study replicate the Wincze et al. (1976) finding that dysfunctional women exhibit significantly less physiological sexual arousal but similar subjective perceptions. These findings may reflect socialization factors that inhibit women from reporting sexual arousal, particularly in the context of an anxiety-eliciting film. Additionally, these patterns reflect the finding that compared with functional women, dysfunctional women gave higher subjective ratings to lower levels of genital arousal. Group differences in physiological response may therefore also be explained by individual differences in *response lability,* defined as the physiological capacity for autonomic arousal. As can be seen in Figure 1, a jagged line across preexposure and erotic stimuli reflects greater fluctuations in the individual genital responses of functional women. A relatively smooth line for the dysfunctional women however, reflects a high degree of VBV consistency.

On the basis of our findings, we propose that the sexual arousal experienced by women may consist of two components: (a) a biological predisposition for physiological arousal (response lability) and (b) a conditioned cognitive expectancy for sexual arousal. Physiologically, "anxiety" may enhance sexual arousal in both sexually functional and dysfunctional women because of generalized sympathetic activation that directly provides a jump start or preparedness for sexual arousal. When sexual cues are provided, this enhanced sympathetic responsivity may activate specific genital responses. Women with greater response lability may be expected to experience proportionately more anxiety (sympathetic activity) as well as genital arousal. The conditioned cognitive expectancy for responding "inappropriately" to sexual stimuli may encourage women to ignore erotic cues and thereby facilitate the extinction of genital arousal. This interpretation of the findings suggests that anxiety enhances genital arousal for both functional and dysfunctional women through sympathetic activation but that both conditions yield lower arousal for dysfunctional women as a result of the interaction of a physiological tendency toward low response lability and negative expectancy, producing a negative feedback loop of dysfunctional sexual response.

Our findings suggest that common components of treatment for sexually dysfunctional women, directed toward extinguishing anxiety and increasing parasympathetic response, may be counterproductive to the physiological elicitation of sexual arousal. Whereas our interpretation does not, of course, rule out a role in sexual arousal for the parasympathetic nervous system, it suggests a more significant role for the sympathetic nervous system than previously assumed. Accordingly, anxiety-reduction techniques may serve to inhibit the sympathetic activation required for the instigation and enhancement of physiological arousal. Although clinical applications must be made cautiously, effective treatment may focus on strategies whereby women learn response synchrony so that physiological excitation that occurs naturally through sympathetic activation, and cognitive expectation, is directed toward a positive feedback loop of sexual arousal. Ultimately, understanding the interplay

between cognitive and physiological sexual response will determine the process by which sympathetic activation facilitates enhanced arousal and may contribute to the alleviation of sexual dysfunction in women.

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